IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Prathyusha K. Salla et al.	§	Confirmation No.	1160
	§	Group Art Unit:	3737
Application No.: 10/723,894	§		
	§	Examiner:	Mehta, Parikha Solanki
Filed: November 26, 2003	§		
For: METHOD AND SYSTEM FOR RETROSPECTIVE GATING USING MULTIPLE INPUTS	§	Atty Docket:	132958-3 GEMS:0263/YOD

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August 26, 2009 — Date

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APPEAL BRIEF PURSUANT TO 37 C.F.R. §§41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal electronically filed and received by the Patent Office on June 26, 2009. Appellants respectfully note that a fee of $510.00 was previously paid in conjunction with the submission of a previous Appeal Brief filed on November 19, 2007. Following the filing of the previous Appeal Brief, the Examiner stated that Appellants' arguments were persuasive and reopened prosecution of the present patent application, which has since resulted in the current appeal. *See* Office Action mailed February 21, 2008.

In light of these facts, Appellants believe that a fee of $30.00, which represents the difference between the current fee of $540.00 and the previously paid amount of $510.00, is due at this time. Accordingly, the Commissioner is authorized to charge $30.00, and any additional fees which may be necessary to advance prosecution of the present application, to Account No. 07-0845, Order No. 132958-3 (GEMS:0263/YOD)

1. REAL PARTY IN INTEREST

The real party in interest is GE Medical Systems Information Technologies, Inc., the Assignee of the above-referenced application by virtue of the Assignment to GE Medical Systems Information Technologies, Inc., a subsidiary of General Electric Company, by Prathyusha K. Salla, Gopal B. Avinash, and Cherik Bulkes, recorded at reel 014755, frame 0386, on November 25, 2003. General Electric Company is the parent company of GE Healthcare, which was previously GE Medical Systems Information Technologies, Inc. Accordingly, General Electric Company, as the parent company of the Assignee of the above-referenced application, will be directly affected by the Board's decision in the pending appeal.

2. RELATED APPEALS AND INTERFERENCES

Appellants are aware of U.S. Patent Application Serial No. 10/723,857, which is currently on appeal and awaiting a decision from the Board, as possibly being related to this Appeal. The undersigned is the Appellants' legal representative in this Appeal.

3. STATUS OF CLAIMS

The present application was originally filed with claims 1-32. Claims 1-32 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal.

4. STATUS OF AMENDMENTS

The claims have not been amended since the Final Office Action mailed on March 27, 2009 (hereinafter the "Final Office Action"). Consequently, there are no outstanding claim amendments to be considered by the Board.

5. SUMMARY OF CLAIMED SUBJECT MATTER

The present invention relates generally to imaging techniques and more particularly to the measurement of the overall motion undergone by an organ. *See, e.g.,* Application at page 1, lines 6-10. Specifically, the present technique relates to measuring the motion of one or more internal organs via one or more external sensors and/or via data acquired from a medical imaging system to determine the overall motion of at least one of the internal organs. *See, e.g., id.* By utilizing the motion measurements, quiescent periods for an organ of interest corresponding to an interval of minimal absolute motion may be determined. *See, e.g., id.* at page 2, line 20 to page 3, line 8. The quiescent period may be used to determine gating points that may be used to gate the image data (prospectively and/or retrospectively) to reduce motion artifacts in a resulting image. *See, e.g., id.* Furthermore, the quiescent period may be used to derive one or more motion compensation factors which may be applied during image processing to further reduce motion artifacts. *See, e.g., id.*

The present Application contains thirty-two claims, namely claims 1-32, all of which are independent claims, and all of which are the subject of this appeal. Appellants respectfully note that while claims 1-32 are all independent claims, claims 1-32 may be grouped as follows:

(i) Claims 1-8 recite similar subject matter, wherein claims 1, 3, 5, and 7 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 2, 4, 6, and 8 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention;

(ii) Claims 9-16 recite similar subject matter, wherein claims 9, 11, 13, and 15 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 10, 12, 14, and 16 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention;

(iii) Claims 17-24 recite similar subject matter, wherein claims 17, 19, 21, and 23 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 18, 20, 22, and 24 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention; and

(iv) Claims 25-32 recite similar subject matter, wherein claims 25, 27, 29, and 31 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 26, 28, 30, and 32 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention.

The subject matter of the pending claims is summarized below. In order to provide the Board a thorough and organized summary of the recited subject matter, claims 1-32 have been summarized in accordance with the aforementioned groupings.

Claims 1-8

As noted above, claims 1-8 recite similar subject matter, wherein claims 1, 3, 5, and 7 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 2, 4, 6, and 8 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention, as will be summarized below.

Claims 1, 3, 5, and 7

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 1 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.* 136) a set of image data (*e.g.*,

134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3, 4. Additionally, the method includes processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, lines 23-28; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (e.g., 144) generated (e.g., 146) from the portion of the set of image data (e.g., 134). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 4-6; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 3 recites computer executable routines that generally correspond to the subject matter recited by claim 1 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 3, discussions of the recited features of claim 3 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 3 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also,* page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 23-28, *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 5 recites an imaging system corresponding to the subject matter recited by claim 1. With regard to the aspect of the invention set forth in independent claim 5, discussions of the recited features of claim 5 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary

embodiment of claim 5 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry 18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 34, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the means for acquiring the set of image data, wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 9, lines 6-15; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Finally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 7 recites an imaging system corresponding to the subject matter recited by claim 1. With regard to the aspect of the invention set forth in independent claim 7, discussions of the recited features of claim 7 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary

embodiment of claim 7 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), and to process a portion of the plurality of signals based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. Additionally, the imaging system (*e.g.*, 10) includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) includes a sensor-based motion measurement system (*e.g.*, 34) configured to measure electrical (*e.g.*, 40, 42, 62, 64) or non-electrical activity (*e.g.*, 44, 46, 66, 68) indicative of the motion of two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) during imaging to contribute to the set of motion data (*e.g.*, 72), wherein the sensor-based motion measurement system (*e.g.*, 34) is separate from the imager (*e.g.*, 12), and wherein the two or more types of organs each perform different physiological functions. *See, e.g., id.* at page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung).

Claims 2, 4, 6, and 8

With regard to the aspect of the invention set forth in independent claim 2, discussions of the recited features of claim 2 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 2 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.* 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3, 4. The method further includes reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 20, lines 12-14 and lines 26-31; *see also*, FIG. 5. Additionally, the method includes processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.* 142) based upon the two or more retrospective gating points and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (*e.g.*, 144) generated (*e.g.*, 146) from the portion of the set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 17-22; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 4 recites computer executable routines that generally correspond to the subject matter recited by claim 2 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 4, discussions of the recited features of claim 4 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 4 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also,* page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Additionally, the computer program a routine for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see* also, FIGs. 1, 5. Finally, the computer program includes a routine for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 6 recites an imaging system corresponding to the subject matter recited by claim 2. With regard to the aspect of the invention set forth in independent claim 6, discussions of the recited features of claim 6 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 6 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry 18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for two or more types of organs from at least one of one or more types of electrical sensors (*e.g.*, 34, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the means for acquiring the set of image data, wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72), and wherein the two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) each perform different physiological functions. *See, e.g., id.* at page 3, lines 10-18; *see also*, page 9, lines 6-15; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung). The imaging system (*e.g.*, 10) further includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 6 to page 10, line 2; *see also*, page 10, line 14 to page 11, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 8 recites an imaging system corresponding to the subject matter recited by claim 2. With regard to the aspect of the invention set forth in independent claim 8, discussions of the recited features of claim 8 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 8 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), to reconstruct (*e.g.*, 140) the plurality of signals to generate a set of reconstructed data (*e.g.*, 142), and to process (*e.g.*, 148) a portion of the reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 7, lines 13-19; *see* also, page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. Additionally, the imaging system (*e.g.*, 10) includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the reconstructed data (*e.g.*, 142) from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) includes a sensor-based motion measurement system (*e.g.*, 34) configured to measure electrical (*e.g.*, 40, 42, 62, 64) or non-electrical activity (*e.g.*, 44, 46, 66, 68) indicative of the motion of two or more types of organs (*e.g.*, heart, lung, stomach, liver, pancreas, etc.) during imaging to contribute to the set of motion data (*e.g.*, 72), wherein the sensor-based motion measurement system (*e.g.*, 34) is separate from the imager (*e.g.*, 12), and wherein the two or more types of organs each perform different physiological functions. *See, e.g., id.* at page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 16, line 12; *see also*, FIGs. 1-3 (noting that FIG. 3 illustrates an example where motion data is acquired for a heart and a lung).

<u>Claims 9-16</u>

As noted above, claims 9-16 recite similar subject matter, wherein claims 9, 11, 13, and 15 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 10, 12, 14, and 16 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention, as will be summarized below.

Claims 9, 11, 13, and 15

With regard to the aspect of the invention set forth in independent claim 9, discussions of the recited features of claim 9 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 9 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). The method includes acquiring (*e.g.*

136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 15, line 11 to page 16, line 9; *see also*, page 20, lines 1-7; *see also*, FIGs. 1, 2. The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 3, 4. Additionally, the method includes processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, lines 23-28; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (e.g., 144) generated (e.g., 146) from the portion of the set of image data (e.g., 134). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 4-6; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 11 recites computer executable routines that generally correspond to the subject matter recited by claim 9 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 11, discussions of the recited features of claim 11 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 11 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device, and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 15, line 11 to page 16, line 9; *see also*, page 20, lines 1-7; *see also*, FIGs. 1, 2. Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Finally, one or more computer readable storage structures includes a routine for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 23-28, *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 13 recites an imaging system corresponding to the subject matter recited by claim 9. With regard to the aspect of the invention set forth in independent claim 13, discussions of the recited features of claim 13 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 13 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry 18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the means for acquiring the set of image data, and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1, 2. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Finally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 15 recites an imaging system corresponding to the subject matter recited by claim 9. With regard to the aspect of the invention set forth in independent claim 15, discussions of the recited features of claim 15 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 15 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), and to process a portion of the plurality of signals based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Additionally, the imaging system (*e.g.*, 10) includes a first sensor-based motion measurement system (*e.g.*, 40) configured to measure electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 4; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-2. Finally, the imaging system (*e.g.*, 10) includes a second sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72), wherein the first (*e.g.*, 40) and second (*e.g.*, 44) sensor-based motion measurement systems are separate from the imager (*e.g.*, 12). *See, e.g., id.* at page 12, line 6 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-2.

Claims 10, 12, 14, and 16

With regard to the aspect of the invention set forth in independent claim 10, discussions of the recited features of claim 10 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 10 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). The method includes acquiring (*e.g.* 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 15, line 11 to page 16, line 9; *see also*, page 20, lines 1-7; *see also*, FIGs. 1, 2. The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3, 4. The method further includes reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 20, lines 12-14 and lines 26-31; *see also*, FIG. 5. Additionally, the method includes processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.* 142) based upon the two or more retrospective gating points and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (*e.g.*, 144) generated (*e.g.*, 146) from the portion of the set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 17-22; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 12 recites computer executable routines that generally correspond to the subject matter recited by claim 10 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 12, discussions of the recited features of claim 12 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 12 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the at least one imaging device, and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 11, line 23 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 15, line 11 to page 16, line 9; *see also*, page 20, lines 1-7; *see also*, FIGs. 1, 2. The one or more computer readable storage structures further includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Additionally, the one or more computer readable storage structures includes a routine for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see* also, FIGs. 1, 5. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 14 recites an imaging system corresponding to the subject matter recited by claim 10. With regard to the aspect of the invention set forth in independent claim 14, discussions of the recited features of claim 14 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 14 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-

15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry 18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) for a respiratory organ from one or more types of electrical sensors (*e.g.*, 42) and one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the means for acquiring the set of image data, and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 1-9; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1, 2. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 6 to page 10, line 2; *see also*, page 10, line 14 to page 11, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 16 recites an imaging system corresponding to the subject matter recited by claim 10. With regard to the aspect of the invention set forth in independent claim 16, discussions of the recited features of claim 16 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary

embodiment of claim 16 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), to reconstruct (*e.g.*, 140) the plurality of signals to generate a set of reconstructed data (*e.g.*, 142), and to process (*e.g.*, 148) a portion of the reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 7, lines 13-19; *see* also, page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Additionally, the imaging system (*e.g.*, 10) includes a first sensor-based motion measurement system (*e.g.*, 40) configured to measure electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 4; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-2. Finally, the imaging system (*e.g.*, 10) includes a second sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72), wherein the first (*e.g.*, 40) and second (*e.g.*, 44) sensor-based motion measurement systems are separate from the imager (*e.g.*, 12). *See, e.g., id.* at page 12, line 6 to page 13, line 3; *see also*, page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-2.

Claims 17-24

As noted above, claims 17-24 recite similar subject matter, wherein claims 17, 19, 21, and 23 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 18, 20, 22, and 24 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention, as will be summarized below.

Claims 17, 19, 21, and 23

With regard to the aspect of the invention set forth in independent claim 17, discussions of the recited features of claim 17 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 17 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.* 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 17, lines 1-25; *see also*, page 19, line 5 to page 20, line 7; *see also*, FIGs. 1-3. The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3, 4. Additionally, the method includes processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, lines 23-28; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (e.g., 144) generated (e.g., 146) from the portion of the set of image data (e.g., 134). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 4-6; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 19 recites computer executable routines that generally correspond to the subject matter recited by claim 17 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 19, discussions of the recited features of claim 19 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 19 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 17, lines 1-25; *see also*, page 19, line 5 to page 20, line 7; *see also*, FIGs. 1-3. Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 23-28, *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 21 recites an imaging system corresponding to the subject matter recited by claim 17. With regard to the aspect of the invention set forth in independent claim 21, discussions of the recited features of claim 21 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 21 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry 18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the means for acquiring the set of image data (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Finally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 23 recites an imaging system corresponding to the subject matter recited by claim 17. With regard to the aspect of the invention set forth in independent claim 23, discussions of the recited features of claim 23 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 23 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), and to process a portion of the plurality of signals based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Additionally, the imaging system (*e.g.*, 10) includes sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity (*e.g.*, 86) indicative of the motion of a heart during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 12; *see also*, page 17, lines 1-12; *see also* page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-3. Finally, the imaging system (*e.g.*, 10) at least one sensor-based motion measurement system (*e.g.*, 40, 44) configured to measure electrical or non-electrical activity (*e.g.*, 82) indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72), wherein each of the sensor-based motion measurement systems is separate from the imager (*e.g.*, 12). *See, e.g., id.* at page 11, line 23 to page 12, line 22; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 17, lines 1-12; *see also*, FIGs. 1-3.

Claims 18, 20, 22, and 24

With regard to the aspect of the invention set forth in independent claim 18, discussions of the recited features of claim 18 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 18 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.* 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The method further includes acquiring a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 17, lines 1-25; *see also*, page 19, line 5 to page 20, line 7; *see also*, FIGs. 1-3. The method further includes processing (*e.g.*, 132) the set of motion data (*e.g.*,

72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3, 4. The method further includes reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 20, lines 12-14 and lines 26-31; *see also*, FIG. 5. Additionally, the method includes processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.* 142) based upon the two or more retrospective gating points and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (*e.g.*, 144) generated (*e.g.*, 146) from the portion of the set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 17-22; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 20 recites computer executable routines that generally correspond to the subject matter recited by claim 18 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 20, discussions of the recited features of claim 20 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 20 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest using at least one imaging device (*e.g.*, 12). *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 9-23; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 17, lines 1-25; *see also*, page 19, line 5 to page 20, line 7; *see also*, FIGs. 1-3. Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Additionally, the one or more computer readable storage structures includes a routine for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see* also, FIGs. 1, 5. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 22 recites an imaging system corresponding to the subject matter recited by claim 18. With regard to the aspect of the invention set forth in independent claim 22, discussions of the recited features of claim 22 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 22 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest. *See, e.g., id.* at page 5, lines 14-18; *see also*, page 8, lines 9-15; *see also*, page 8, line 28 to page 9, line 4; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data acquisition circuitry

18, motion determination system 34, sensors 36) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72) comprising cardiac motion data (*e.g.*, MCG 86) acquired by one or more types of non-electrical sensors (*e.g.*, 46) and respiratory motion data (*e.g.*, pulmonary waveform 82) acquired by at least one of one or more types of electrical sensors (*e.g.*, 42) or one or more types of non-electrical sensors (*e.g.*, 46), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) for acquiring the cardiac and respiratory motion data are separate from the means for acquiring the set of image data (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 4, lines 22-31; *see also*, page 11, line 4 to page 12, line 12; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. The imaging system (*e.g.*, 10) further includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 6 to page 10, line 2; *see also*, page 10, line 14 to page 11, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 24 recites an imaging system corresponding to the subject matter recited by claim 18. With regard to the aspect of the invention set forth in independent claim 24, discussions of the recited features of claim 24 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 24 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals (*e.g.*, 54, 58) representative of a region of interest. *See, e.g., id.* at page 8, line 9 to page 9, line 4; *see also*, page 13, line 11 to page 14, line 21; *see also*, FIGs. 1-2. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), to reconstruct (*e.g.*, 140) the plurality of signals to generate a set of reconstructed data (*e.g.*, 142), and to process (*e.g.*, 148) a portion of the reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 7, lines 13-19; *see* also, page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Additionally, the imaging system (*e.g.*, 10) includes sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity (*e.g.*, 86) indicative of the motion of a heart during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 12; *see also*, page 17, lines 1-12; *see also* page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-3. Finally, the imaging system (*e.g.*, 10) at least one sensor-based motion measurement system (*e.g.*, 40, 44) configured to measure electrical or non-electrical activity (*e.g.*, 82) indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data (*e.g.*, 72), wherein each of the sensor-based motion measurement systems is separate from the imager (*e.g.*, 12). *See, e.g., id.* at page 11, line 23 to page 12, line 22; *see also*, page 14, line 23 to page 15, line 9; *see also*, page 17, lines 1-12; *see also*, FIGs. 1-3.

<u>Claims 25-32</u>

As noted above, claims 25-32 recite similar subject matter, wherein claims 25, 27, 29, and 31 are directed towards a method, a computer program, and imaging systems in accordance with one aspect of the invention, and claims 26, 28, 30, and 32 are directed towards a method, a computer program, and imaging systems in accordance with a further aspect of the invention, as will be summarized below.

Claims 25, 27, 29, 31

With regard to the aspect of the invention set forth in independent claim 25, discussions of the recited features of claim 25 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 25 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, lines 14-23; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. The method further includes processing (*e.g.*, 132) the sets of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3-4. Additionally, the method includes processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, lines 23-28; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (e.g., 144) generated (e.g., 146) from the portion of the set of image data (e.g., 134). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 4-6; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 27 recites computer executable routines that generally correspond to the subject matter recited by claim 25 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 27, discussions of the recited features of claim 27 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 27 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, lines 14-23; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the sets of motion data (*e.g.*, 72, 80) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 23-28, *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 29 recites an imaging system corresponding to the subject matter recited by claim 25. With regard to the aspect of the invention set forth in independent claim 29, discussions of the recited features of claim 29 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 29 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, ECG 84, MCG 86) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42, ECG 84) and non-electrical sensors (*e.g.*, 46, MCG 86) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, lines 14-23; *see also*, page 14, line 23 to page 15, line 9; *see also* page 17, lines 1-25; *see also*, FIGs. 1-3. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Finally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 138) a portion of the set of image data (*e.g.*, 134) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 31 recites an imaging system corresponding to the subject matter recited by claim 25. With regard to the aspect of the invention set forth in independent claim 31, discussions of the recited features of claim 31 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 31 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals representative of a region of interest, wherein the imager (*e.g.*, 12) comprises one of a MRI imager, a PET imager, a nuclear imager, an X-ray imager, a PET-CT imager, and an ultrasound imager. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), and to process a portion of the plurality of signals based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the plurality of signals from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs.

1, 5. Additionally, the imaging system (*e.g.*, 10) includes at least one sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity (*e.g.*, 86) indicative of the motion of a heart during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 12; *see also*, page 12, line 24 to page 13, line 3; *see also*, page 17, lines 1-25; *see also* page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-3. Finally, the imaging system (*e.g.*, 10) includes at least one sensor-based motion measurement system (*e.g.*, 40) configured to measure electrical activity (*e.g.*, 84) indicative of the motion of the heart during imaging to contribute to the set of motion data (*e.g.*, 72), wherein each of the sensor-based motion measurement systems is separate from the imager (*e.g.*, 12). *See, e.g., id.*

Claims 26, 28, 30, and 32

With regard to the aspect of the invention set forth in independent claim 26, discussions of the recited features of claim 26 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 26 provides a method for processing (*e.g.*, 138) image data (*e.g.*, 134). *See, e.g., id.* at page 3, line 10 to page 6, line 6; *see also*, FIG. 5. The method includes acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The method further includes acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, lines 14-23; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. The method further includes processing (*e.g.*, 132) the sets of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; see *also*, FIGs. 3-4. The method includes comprises reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 20, lines 12-14 and lines 26-31; *see also*, FIG. 5. Additionally, the method includes processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.* 142) based upon the two or more retrospective gating points and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 4, 5. Finally, the method includes displaying or storing an image (*e.g.*, 144) generated (*e.g.*, 146) from the portion of the set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 15-19; *see also*, page 21, lines 17-22; *see also*, FIGs. 1, 5.

Next, Appellants respectfully note that claim 28 recites computer executable routines that generally correspond to the subject matter recited by claim 26 and are stored on one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 9, line 25 to page 10, line 2. With regard to the aspect of the invention set forth in independent claim 28, discussions of the recited features of claim 28 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 28 provides one or more computer readable storage structures (*e.g.* RAM, magnetic and optical storage devices, etc.). *See e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, FIG. 1. The one or more computer readable storage structures includes a routine for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The one or more computer readable storage structures further includes a routine for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42) and non-electrical sensors (*e.g.*, 46) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, lines 14-23; *see also*, page 8, lines 9-15 and lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 17, lines 1-25; *see also*, FIGs. 1-3. Additionally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 132) the sets of motion data (*e.g.*, 72, 80) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, page 20, lines 14-17; *see also*, FIGs. 1, 3-4. Additionally, the one or more computer readable storage structures includes a routine for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see* also, FIGs. 1, 5. Finally, the one or more computer readable storage structures includes a routine for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 8, lines 19-26; *see also*, page 9, line 25 to page 10, line 2; *see also*, page 20, line 31 to page 21, line 6; *see also*, page 21, lines 14-22; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 30 recites an imaging system corresponding to the subject matter recited by claim 26. With regard to the aspect of the invention set forth in independent claim 30, discussions of the recited features of claim 30 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 30 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes means (*e.g.*, imager 12) for acquiring (*e.g.*, 136) a set of image data (*e.g.*, 134) representative of a region of interest from an imager (*e.g.*, 12) of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The imaging system (*e.g.*, 10) further includes means (*e.g.*, ECG 84, MCG 86) for acquiring (*e.g.*, 64, 68) a set of motion data (*e.g.*, 72, cardiac motion waveforms 80) for a heart from one or more types of electrical sensors (*e.g.*, 42, ECG 84) and one or more types of non-electrical sensors (*e.g.*, 46, MCG 86), wherein the electrical (*e.g.*, 42, ECG 84) and non-electrical sensors (*e.g.*, 46, MCG 86) are separate from the imager (*e.g.*, 12), and wherein the set of image data (*e.g.*, 134) is acquired substantially concurrent with the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 5, line 25 to page 6, line 6; *see also*, page 14, line 23 to page 15, line 9; *see also* page 17, lines 1-25; *see also*, FIGs. 1-3. The imaging system further includes (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 132) the set of motion data (*e.g.*, 72) to extract two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, lines 9-19; *see also*, page 18, line 24 to page 19, line 12; *see also*, page 19, line 26 to page 20, line 1; *see also*, FIGs. 1, 3-4. Additionally, the imaging system (*e.g.*, 10) includes means (*e.g.*, data processing circuitry 20, operator workstation 22) for reconstructing (*e.g.*, 140) the set of image data (*e.g.*, 134) to generate a set of reconstructed data (*e.g.*, 142). *See, e.g., id.* at page 9, lines 6 to page 10, line 2; *see also*, page 10, line 14 to page 11, line 2; *see also*, page 20, lines 12-14 and lines 26-31; *see also*, FIGs. 1, 5. Finally, the imaging system (*e.g.*, 10) means (*e.g.*, data processing circuitry 20, operator workstation 22) for processing (*e.g.*, 148) a portion of the set of reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating points (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 9, line 6 to page 10, line 19; *see also*, page 20, lines 23-28; *see also*, FIGs. 1, 4-5.

Next, Appellants respectfully note that claim 32 recites an imaging system corresponding to the subject matter recited by claim 26. With regard to the aspect of the invention set forth in independent claim 32, discussions of the recited features of claim 32 can be found at least in the below cited locations of the specification and drawings. By way of example, an exemplary embodiment of claim 32 provides an imaging system (*e.g.*, 10). *See, e.g., id.* at page 8, lines 9-15; *see also*, FIG. 1. The imaging system (*e.g.*, 10) includes an imager (*e.g.*, 12) configured to generate a plurality of signals representative of a region of interest, wherein the imager (*e.g.*, 12) comprises one of a MRI imager, a PET imager, a nuclear imager, an X-ray imager, a PET-CT imager, and an ultrasound imager. *See, e.g., id.* at page 5, lines 16-18 and lines 27-29; *see also*, page 8, lines 9-15; *see also*, page 22, lines 12-16; *see also*, FIGs. 1, 5. The imaging system (*e.g.*,

10) further includes data acquisition circuitry (*e.g.*, 18) configured to acquire the plurality of signals. *See, e.g., id.* at page 8, line 28 to page 9, line 7; *see also*, FIG. 1. The imaging system (*e.g.*, 10) further includes data processing circuitry (*e.g.*, 20) configured to receive the plurality of signals, to process a set of motion data (*e.g.*, 72) to derive two or more retrospective gating points (*e.g.*, 110) and one or more motion compensation factors (*e.g.*, 106), to reconstruct (*e.g.*, 140) the plurality of signals to generate a set of reconstructed data (*e.g.*, 142), and to process (*e.g.*, 148) a portion of the reconstructed data (*e.g.*, 142) based upon the two or more retrospective gating signals (*e.g.*, 110) and the one or more motion compensation factors (*e.g.*, 106). *See, e.g., id.* at page 7, lines 13-19; *see* also, page 9, lines 8-19; *see also*, FIGs. 1, 4-5. The imaging system (*e.g.*, 10) further includes system control circuitry (*e.g.*, 16) configured to operate at least one of the imager (*e.g.*, 12) and the data acquisition circuitry (*e.g.*, 18). *See, e.g., id.* at page 8, lines 17-26; *see also*, FIG. 1. Additionally, the imaging system (*e.g.*, 10) includes an operator workstation (*e.g.*, 22) configured to communicate with the system control circuitry (*e.g.*, 16) and to receive at least the processed portion of the reconstructed data (*e.g.*, 142) from the data processing circuitry (*e.g.*, 20). *See, e.g., id.* at page 9, line 8 to page 10, line 19; *see also*, FIGs. 1, 5. Additionally, the imaging system (*e.g.*, 10) includes at least one sensor-based motion measurement system (*e.g.*, 44) configured to measure non-electrical activity (*e.g.*, 86) indicative of the motion of a heart during imaging to contribute to the set of motion data (*e.g.*, 72). *See, e.g., id.* at page 11, line 23 to page 12, line 12; *see also*, page 12, line 24 to page 13, line 3; *see also*, page 17, lines 1-25; *see also* page 14, line 23 to page 15, line 9; *see also*, FIGs. 1-3. Finally, the imaging system (*e.g.*, 10) includes at least one sensor-based motion measurement system (*e.g.*, 40) configured to measure electrical activity (*e.g.*, 84) indicative of the motion of the heart during imaging to contribute to the set of motion data (*e.g.*, 72), wherein each of the sensor-based motion measurement systems is separate from the imager (*e.g.*, 12). *See, e.g., id.*

A benefit of the invention, as recited in the foregoing claims, is to provide for the reduction of motion artifacts in a resulting image when imaging an organ of interest. Accordingly, an imager and multiple sensors (*e.g.*, electrical sensors 42, non-electrical sensors 46) are provided by the technique for acquiring motion data. The sensors may be configured to acquire motion data from one or more organs. The motion data is processed to determine one or more quiescent periods for the organ of interest corresponding to an interval of minimal absolute motion for the organ. By analyzing the quiescent periods, one or more gating points, as well as motion compensation factors, may be extracted and applied to the imaging process in order to generate images having reduced motion artifacts.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected claims 1-32 under 35 U.S.C. §112, first paragraph, for failing to comply with the enablement requirement.

B. Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected claims 1-8 under 35 U.S.C. §103(a) as being unpatentable over the publication entitled "PC-Based System for Retrospective Cardiac and Respiratory Gating of NMR Data," by Bohning et al. (hereinafter the "Bohning reference") in view of the publication entitled "Subject-Specific Motion Correction Factors for Magnetic Resonance Coronary Angiography," by Keegan et al. (hereinafter the "Keegan reference").

C. Third Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's third ground of rejection in which the Examiner rejected claims 9-32 under 35 U.S.C. §103(a) as being unpatentable over the Bohning reference in view of the Keegan reference, and further in view of Rogers, U.S. Patent No. 5,477,144 (hereinafter the "Rogers reference").

7. **ARGUMENT**

As discussed in detail below, it is believed that the Examiner has improperly rejected the pending claims. Particularly, it is believed that the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Sections 112 and 103. Accordingly, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-32 are in condition for allowance.

As a preliminary matter, Appellants also note that the Examiner, in the Final Office Action, also set forth two separate grounds of provisional obviousness-type double patenting rejections. Particularly, the Examiner provisionally rejected claims 1-16 as being unpatentable over claims 1-8 and 17-24 of co-pending U.S. Patent Application Serial No. 10/723,894, and further provisionally rejected claims 17-32 as being unpatentable over claims 17-32 of co-pending U.S. Patent Application Serial No. 10/723,894 in view of the Rogers reference. *See* Final Office Action, pages 4-5. Although these two issues are provisional rejections and are therefore not considered ripe for appeal, it should be noted that Appellants do not necessarily agree with the Examiner's assertions with regard to the obviousness-type double patenting rejections. However, Appellants may be amenable to filing a terminal disclaimer upon allowance of the claims in the present application. As the Board will appreciate, any such filing will depend on the prosecution and state of these claims, as well as the state of the claims in the above-cited co-pending application, at the time of allowance. For instance, depending on the Board's decision in the present Appeal, as well as any subsequent prosecution of the present application, the claims which are ultimately allowed may be *significantly* different from their present form. Thus, it is quite possible that the Examiner's double-patenting rejections may no longer be proper or applicable with regard to the claims which ultimately issue. Accordingly, Appellants respectfully request that the Board and the Examiner hold in abeyance the double-patenting rejections until the present claims are determined to be allowable.

A. **<u>First Ground of Rejection</u>**

As stated above, the Examiner rejected claims 1-32 under 35 U.S.C. § 112, first paragraph, for failing to comply with the enablement requirement. Appellants respectfully traverse this rejection.

1. **<u>Judicial precedent has clearly established a legal standard with regard to the enablement requirements set forth under 35 U.S.C. § 112, first paragraph.</u>**

Regarding the enablement requirement, the Examiner has the initial burden to establish a *reasonable basis* to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). The test for enablement, as set forth by the Supreme Court, is whether the experimentation needed to practice the invention is undue or unreasonable. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d 1331, 1332 (Fed. Cir. 1991). The *undue experimentation* test essentially evaluates whether one of reasonable skill in the art can make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. *U.S. v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988). As long as the specification discloses at least one method for making and using the claimed invention that bears a *reasonable correlation* to the entire scope of the claim, then the enablement requirement of Section 112 is satisfied. *In re Fisher*, 427 F.2d 833, 839, 166 U.S.P.Q. 18, 24 (C.C.P.A. 1970). The specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation. *In re Borkowski*, 422 F.2d 904, 908, 164 USPQ 642, 645 (C.C.P.A. 1970).

2. **<u>Contrary to the Examiner's assertions, claims 1-32 are believed to fully comply with the enablement requirements set forth under 35 U.S.C. §112, first paragraph.</u>**

Independent claims 1-32 each recite the determination/extraction of one or more <u>motion compensation factors</u>, which may used during the processing of image data. Particularly, the present application discloses that the recited motion compensation factors may be used in conjunction with retrospective gating points in order to generate diagnostic images having reduced motion artifacts. In rejecting independent claims 1-32 under Section 112, first paragraph, the Examiner stated:

> Claims 1-32 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 1-32 recite "motion compensation factors" which were not described in the disclosure in sufficient detail such that one of ordinary skill in the art would be reasonably apprised of how to use and make the claimed invention. The specification lacks any and all specific description of exactly what a motion compensation factor is, or precisely how it is derived, other than the generalized statement that the determination of the factors "may involve modeling the anticipated motion" (Specification p. 18 paragraph 3). For the purposes of further examination herein, Examiner interprets "motion compensation factor" to mean any quality or characteristic related to motion of the imaged objects.
>
> Final Office Action, page 3.

For at least the reasons discussed below, Appellants respectfully disagree with this rejection.

As discussed in a previous communication, the present application clearly sets forth that in addition to the extraction of retrospective gating points from the sensor-acquired motion data, one or more <u>motion compensation factors</u> may also be extracted for image processing. *See* Application, page 18, line 24 to page 19, line 3; *see also* FIG. 4; *see also* "Remarks" section of

Response to Office Action mailed on August 28, 2008. Further, Appellants note that the present application clearly discloses that the recited motion compensation factors may be determined non-iteratively using organ motion models based on a priori data (motion is previously known) or may be extracted using iterative algorithms applied to the sensor-acquired motion data itself (e.g., motion was not previously known), and that the application of such factors may help to compensate for unwanted motion artifacts in reconstructed images of moving organs. *See id.* As such, Appellants respectfully disagree with the Examiner's general position that the specification fails to provide a description of how motion compensation factors are derived. Indeed, based on at least these teachings, Appellants respectfully assert that one of ordinary skill in the art would be able to practice the image processing techniques described in the present application without undue experimentation and, thus, independent claims 1-32 satisfy the enablement requirement under Section 112, first paragraph. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916); *see also U.S. v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed. Cir. 1988).

In the Final Office Action, the Examiner asserted that the recited "motion compensation factors" of claims 1-32 are "not such a standard element known in the art such that one of ordinary skill would be reasonably apprised of what Applicant considers to be such a factor conceived of within the present invention, nor would one of ordinary skill in the art be reasonably apprised of how to derive or acquire such a factor." Final Office Action, page 5. The Examiner further stated that "Applicant could not possibly have conceived of and successfully used with the present invention each and every possible quality or characteristic related to motion of the imaged objects." *Id.* at page 6. Appellants respectfully disagree with this line of reasoning.

First, with regard to the Examiner's assertions that Appellants did not contemplate *every* possible type of motion compensation factor, Appellants stress that the former Court of Customs and Patent Appeals has made it clear that the "specification need not contain an example if the invention is otherwise disclosed in such manner that one skilled in the art will be able to practice it without an undue amount of experimentation." *In re Borkowski*, 422 F.2d 904, 908, 164

USPQ 642, 645 (C.C.P.A. 1970) (emphasis added). With these legal guidelines in mind, Appellants note that the Examiner failed to offer any evidence in the Final Office Action to support an assertion that one of ordinary skill in the art would be burdened by undue experimentation when attempting to utilize motion compensation factors in conjunction with retrospective gating in practicing the image processing techniques set forth in Appellants' disclosure. Still further, as discussed above, Appellants provided at least one example in the specification of motion compensation factors that may be determined based on previously known organ motion data (e.g., a priori data in the form of an organ motion model). Thus, although Appellants may not have necessarily discussed *every* possible type of motion compensation factor that may be utilized, it is believed that the example(s) provided in the specification are <u>clearly sufficient to enable one skilled in the art to understand how to apply motion compensation factors</u> in conjunction with retrospective gating.

Second, Appellants further disagree with the Examiner's assertion that (1) those skilled in the art would *not* be reasonably apprised of what constitutes a motion compensation factor, and (2) that the techniques for deriving motion compensation factors would require undue experimentation. For instance, in the Advisory Action mailed on June 19, 2009 (hereinafter the "Advisory Action"), the Examiner responded to the above remarks by stating that "[t]he mere statement that the motion compensation factor 'may be based on a prior data in the form of an organ motion model' is vague and non-specific and does not enable a skilled artisan to derive the factor from such a priori data without undue experimentation." Advisory Action, page 2. Appellants again stress that there is simply no basis for such an assertion, nor has the Examiner provided and concrete evidence as to why it is believed that a skilled artisan would be unable to understand how to utilize motion compensation factors based upon the *known* motion patterns (e.g., a priori data) for a particular organ.

To the contrary, Appellants believe that those skilled in the art that routinely practice the art of medical imaging will regularly encounter challenges in producing an image of a *moving* organ that is free of or contains relatively few motion-related artifacts. Accordingly, those skilled in the art will readily appreciate that if the motion of the moving organ is already known (e.g., a priori data from organ motion models) or may be anticipated (e.g., using iterative motion algorithms), then such motion may be compensated for, thus preventing or substantially reducing the occurrence/appearance of unwanted motion artifacts in a resulting reconstructed image. In other words, it is believed that those skilled in the art having the benefit of the present disclosure will readily appreciate that various motion compensation factors could be utilized (either based on known motion or anticipated motion) to process image data pertaining to a particular organ and to generate images having reduced motion artifacts. Accordingly, because the Examiner has failed to provide a convincing line of reasoning as to why one skilled in the art would not understand what constitutes a "motion compensation factor," and because the Examiner has failed to provide evidence that the utilization of motion compensation factors in the imaging techniques recited by claims 1-32 would require undue experimentation, Appellants respectfully submit that the rejection of claims 1-32 under Section 112, first paragraph, is improper.

3. **Request Withdrawal of the Rejection**

For at least the reasons discussed above, Appellants respectfully request that the Board direct the Examiner to withdraw the rejection of independent claims 1-32 under 35 U.S.C. §112, first paragraph.

B. **Second Ground of Rejection**

The Examiner rejected claims 1-8 under 35 U.S.C. §103(a) as being unpatentable over the Bohning reference in view of the Keegan reference. Appellants respectfully traverse this rejection.

1. **Judicial precedent has clearly established a legal standard for a *prima facie* obviousness rejection.**

The burden of establishing a prima facie case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (PTO Bd. App. 1979). In addressing obviousness determinations under 35 U.S.C. §103, the Supreme Court in *KSR International Co. v. Teleflex*

Inc., 127 S. Ct. 1727 (2007), reaffirmed many of its precedents relating to obviousness including its holding in *Graham v. John Deere Co.*, 383 U.S. 1 (1966). In *KSR*, the Court also reaffirmed that "a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *Id.* at 1741. In this regard, the *KSR* court stated that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does … because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *Id.* Furthermore, the *KSR* court did not diminish the requirement for objective evidence of obviousness. *Id.* ("To facilitate review, this analysis should be made explicit. See *In re Kahn*, 441 F.3d 977, 988 (CA Fed. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")). As our precedents make clear, however, the analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ."); *see also In re Lee*, 61 U.S.P.Q.2d 1430, 1436 (Fed. Cir. 2002) (holding that the factual inquiry whether to combine references must be thorough and searching, and that it must be based on *objective evidence* of record).

Further, when prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). The Federal Circuit has warned that the Examiner must not, "fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *In re*

Dembiczak, F.3d 994, 999, 50 U.S.P.Q.2d 52 (Fed. Cir. 1999) (quoting *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983)).

Additionally, Appellants note that it is improper to combine references where the references teach away from their combination. *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983); M.P.E.P. §2145. Moreover, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959); see M.P.E.P. §2143.01(VI). If the proposed modification or combination would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984); see M.P.E.P. §2143.01(V).

2. **The combination of the Bohning and Keegan references is improper to support the rejection of independent claims 1-8 under Section 103.**

Although the present section specifically addresses the rejection of independent claims 1-8, it should be noted that all the pending claims (e.g., claims 1-32) each recite the determination and/or extraction of one or more "motion compensation factors," which may used in the processing of image data, as generally discussed above in Section 7.A.2. In the Final Office Action, the Examiner admitted that the Bohning reference fails to disclose the recited motion compensation factors and, therefore, cited the Keegan reference to remedy these deficiencies. *See* Final Office Action, page 3. As will be discussed below, Appellants do not believe that there is any objective motivation for combining the Bohning and Keegan references in the manner suggested by the Examiner. Particularly, each of these references appears to adequately address the issue of motion-related artifacts in medical imaging, and thus do not appear to be amenable to the modifications suggested by the Examiner.

For example, the Bohning reference appears to disclose that respiratory and cardiac imaging using nuclear magnetic resonance (NMR) techniques is often subjected to unwanted motion-related artifacts due at least partially to the generally constant motion of the cardiac and respiratory organs while image acquisition is occurring. *See* Bohning, page 303. Particularly, the Bohning reference notes that NMR image acquisition acquired in typical single-slice multiphase acquisitions are subject to several inherent problems. *See id.* at 304. One such problem relates not only to the motion of the heart, but also the nonconstant (e.g., changing) rate of the heartbeat (e.g., a patient's heart rate may change over time), which may ultimately result in non-uniform R-R intervals in an electrocardiograph (ECG) trace. As explained by the Bohning reference, nonconstant R-R intervals may result in unequal signal recovery between multiphase sets and incorrect phasing of the data acquisition, which may result in increased image noise, motion artifacts, and image blurring, all of which may degrade the resulting images and impair a physician's ability to make a proper diagnosis. *See id.*

To address these drawbacks, the Bohning reference discloses a technique referred to as "clustering," which uses stored ECG timing to adjust NMR cardiac data phasing based upon the inherent irregularities in the heart's movements, rather than attempting to impose regular NMR measurements. *See id.* at pages 306-307. For instance, "clustering," as described by the Bohning reference, involves determining an appropriate cardio-respiratory time cluster for each NMR measurement profile and rearranging the serially collected raw data *into-time clustered sets*, wherein each set corresponds to a particular area of a normalized C-R plane. *See id.* at page 311. In other words, as best understood by Appellants, the Bohning reference solves motion-related problems in NMR imaging by "binning" or classifying acquired image data based upon a corresponding phase within an R-R interval at which the data is acquired, such that the image data associated with a particular "cluster" all generally corresponds to the same phase of the cardiac cycle.

With these points in mind, Appellants note that the Keegan reference, which was cited by the Examiner in combination with the Bohning reference, addresses what appears to be a similar issue, i.e., image acquisition of a moving organ, but by a different means. Instead of using a "clustering" or binning technique, as described in the Bohning reference, the Keegan reference appears to discuss the use of motion correction factors that may be derived based upon the motions of the heart and the diaphragm in three orthogonal directions. *See* Keegan, page 67. In particular, motion in the head-foot (HF) direction, the anterior-posterior (AP) direction, and the left-right (LR) direction may be measured and subsequently used to assess the motion of the heart as a function of diaphragm position. *See id.* at pages 67-68. The Keegan reference further notes that, based on this data, correction factors may be calculated for each of the three orthogonal directions as a ratio of the FH, AP, and LR displacements of the coronary artery between inspiratory and expiratory scans to that of the dome of the right hemi-diaphragm. *See id.* at page 68. Accordingly, these correction factors may be utilized to compensate for motion during imaging and, thus, reduce or prevent the occurrence of motion-related artifacts.

With the above discussion in mind, Appellants note that the Keegan reference essentially addresses the same problem set forth in the Bohning reference, but in the completely different manner. To summarize, the Bohning reference solves imaging problems relating to motion by acquiring a set of data, and then binning or "clustering" the data into different groups based upon, for example, a corresponding phase within an R-R interval at which the data is acquired. For example, cardiac data acquired over one R-R interval may be binned into different groups based on the various cardiac phases that occur within an R-R interval. In other words, motion, in accordance with the teachings of Bohning, is not "corrected" based upon correction factors. Rather, the data is re-arranged such that all data corresponding to the same phase of a motion cycle is grouped together, thus effectively "masking" motion-related artifacts. Thus, images derived using the binned or clustered images should not exhibit motion because the underlying data is all acquired, presumably, at the *same phase* of the cardiac cycle. The Keegan reference, in contrast, does not bin or cluster the image data, but instead determines correction factors in one or more orthogonal directions in order to compensate for motion that occurs during image acquisition. However, because both the Bohning and Keegan references appear to adequately address the issue of motion during image acquisition, there appears to be no objective basis for modifying the Bohning reference as suggested by the Examiner. That is, the same-phase images generated using the techniques disclosed by the Bohning reference *should not* exhibit any motion artifacts that would need to be compensated using the techniques disclosed by the Keegan reference.

Further, even assuming that the "correction factors" discussed in the Keegan reference could be considered analogous to the recited "motion compensation factors" of claims 1-8, the Examiner's stated motivation to modify the Bohning reference, i.e., to calculate a motion compensation factor and to process images according to such a factor, appears to be entirely baseless, as the problems relating to motion artifacts in the Bohning reference are *already* addressed by using the above-discussed image clustering techniques. *See* Final Office Action, page 3. In other words, because the Bohning reference indicates that the disclosed image clustering techniques adequately solves motion-related issues during imaging, one skilled in the art would find no need to further modify the Bohning reference to further address motion-related issues, nor has the Examiner provided any reasonable objective basis as to why one skilled in the art would want to further modify the Bohning reference to essentially solve a problem that has *already* been solved.

In response to these remarks, the Examiner further attempted to justify the foregoing combination of the Bohning and Keegan references in the Advisory Action by stating that "Keegan teaches that the use of a motion compensation factor is *more accurate* for correction motion artifacts [*sic*] in image data, wherein such teaching itself would sufficiently motivate a skilled artisan to use the motion compensation of Keegan *instead* of that of Bohning in the method and system of Bohning." Advisory Action, page 2. (Emphasis added). In other words, the Examiner appears to be asserting that the Keegan reference provides a teaching that the use of the disclosed "motion correction factors" is more accurate and thus preferable over the image clustering and binning techniques provided in the Bohning reference. However, after careful review, it does not appear that the Keegan reference discloses or supports what the Examiner is asserting. In particular, Appellants can find no mention in the Keegan reference with regard to the use of motion correction factors being superior to "image clustering," as disclosed by the Bohning reference, nor has the Examiner cited any specific support for such an assertion. Moreover, even assuming hypothetically that the Examiner's assertions in the Advisory Action have any basis whatsoever, Appellants again stress that independent claims 1-8 each recite the use retrospective gating points *in combination with* one or more motion compensation factors. However, based on the statements in the Advisory Action, it appears that the Examiner has essentially admitted that the references teach that the use of motion compensation is *preferred*, and that one skilled in the art would be motivated to use motion correction factors *instead* of (e.g., *not* in combination with) the image clustering techniques set forth in Bohning.

In light of these observations, Appellants believe that the reasons proffered by the Examiner in the Final Office Action and in the Advisory Action for combining the cited references appear to be nothing more than a pretext for an unneeded modification to the Bohning reference solely to justify the present rejection, i.e., the motivation appears to be based solely on the improper use of hindsight. As the Board will appreciate, such a motivation is clearly not objective nor is it based on the teachings demonstrated in the art.

3. **Request Withdrawal of the Rejection.**

Given the absence of an objective motivation to combine the Bohning and Keegan references, Appellants respectfully submit that no *prima facie* case of obviousness is believed to exist with respect to independent claims 1-8 of the present application. Accordingly, Appellants respectfully request that the Board direct the Examiner to withdraw the rejection of claims 1-8 under 35 U.S.C. § 103(a) and to allow these claims.

C. **Third Ground of Rejection**

The Examiner rejected claims 9-32 under 35 U.S.C. § 103(a) as being unpatentable over the Bohning reference in view of the Keegan reference, and further in view of the Rogers reference. Appellants respectfully traverse this rejection.

1. **Judicial precedent has clearly established a legal standard for a *prima facie* obviousness rejection.**

Like the second ground of rejection based upon the Bohning and Keegan references and discussed above in Section 7.B, claims 9-32 were also rejected under 35 U.S.C. § 103(a). Thus, to avoid redundancy, Appellants have not restated the legal precedent regarding obviousness rejections in discussing the third ground of rejection, but rather respectfully request that the Board consider the legal guidelines already provided above in Section 7.B.1.

2. **The combination of the Bohning, Keegan, and Rogers references is improper to support the rejection of independent claims 17-24 under Section 103.**

Like independent claims 1-8, each of independent claims 17-24 also recites the determination and/or extraction of one or more "motion compensation factors," which may used in the processing of image data, as summarized above in Section 7.A.2. Accordingly, Appellants respectfully submit that the combination of the Bohning and Keegan references in the manner suggested by the Examiner for rejecting claims 17-24 is improper for at least the same reasons discussed above in Section 7.B.2 regarding rejection of claims 1-8. That is, each of the Bohning and Keegan references appears to adequately address the issue of motion-related artifacts in medical imaging using *different* respective techniques (e.g., image clustering vs. motion correction factors). As such, there does not appear to be any objective motivation for modifying these references in the manner asserted by the Examiner. Accordingly, regardless of whether the Rogers reference is properly combinable with either of the Bohning or Keegan references, the rejection of claims 17-24 is believed to be in error given the improper combination of the Bohning and Keegan references.

3. **<u>The combination of the Bohning, Keegan, and Rogers references is improper to support the rejection of independent claims 9-16 and 25-32 under Section 103.</u>**

Each of independent claims 9-16 and 25-32 also recites the determination and/or extraction of one or more "motion compensation factors," which may used in the processing of image data, as summarized above in Section 7.A.2. Thus, Appellants respectfully submit once again that the combination of the Bohning and Keegan references in the manner suggested by the Examiner for rejecting claims 9-16 and 25-32 is improper for at least the same reasons discussed above in Section 7.B.2 regarding rejection of claims 1-8. That is, each of the Bohning and Keegan references appears to adequately address the issue of motion-related artifacts in medical imaging using *different* respective techniques (e.g., image clustering vs. motion correction factors). As such, there does not appear to be any objective motivation for modifying these references in the manner asserted by the Examiner.

However, even assuming hypothetically that the Examiner's combination of the Keegan and Bohning references could be supported, Appellants do not believe that the Keegan and Bohning references teach every element recited by independent claims 9-16 and 25-32 when further combined with the Rogers reference. For instance, independent claims 9-16 and 25-32 are directed towards various methods and systems, as well as computer readable media storing a computer program, all of which reflect various embodiments of the present invention. Appellants note, however, that claims 9-16 each commonly recite the acquisition of motion data for a respiratory organ (e.g., a lung) using <u>both electrical *and* non-electrical sensors</u>. Similarly, claims 25-32 each commonly recite the acquisition of motion data for a heart using <u>both electrical *and* non-electrical sensors</u>. In other words, claims 9-16 and claims 25-32 recite the <u>concurrent</u> use of both electrical *and* non-electrical sensors. After careful review, Appellants do not believe that the cited references, either alone or in combination, teaches the use of electrical *and* non-electrical sensors concurrently.

In the Final Office Action, the Examiner acknowledged that the Bohning and Keegan references disclose electrical sensors, but not the use of non-electrical sensors. The Examiner then cited the Rogers reference to purportedly remedy this deficiency. Although the Rogers reference does appear to mention that non-electrical sensors (e.g., pressure transducers, acoustic microphones, etc.) may be used during image acquisition, it appears that the Rogers reference mentions non-electrical sensors as being <u>an *alternative* to electrical sensors</u>. For instance, the primary embodiment depicted by FIG. 4 of the Rogers reference provides an electrocardiogram (ECG – a well known *electrical* sensor) for acquiring cardiac motion data. The Rogers reference appears to indicate that cardiac motion data is not limited to being measured by an ECG, but may be measured by "any suitable means" including a pressure transducer, an acoustic microphone, a piezoelectric crystal transducer, strain gauges, or air flow meters. *See* Rogers, col. 5, lines 53-63. In other words, the Rogers reference appears to suggest these additional types of electrical/non-electrical sensors as being *alternatives* to an ECG. Appellants are unable to locate any teaching or suggestion, however, that the Rogers reference discloses that non-electrical sensors are used *concurrently* with electrical sensors. Thus, when combined with the Keegan and/or Bohning references, the Rogers reference appears to merely suggest that the electrical sensors disclosed in the Keegan and Bohning references may be replaced with non-electrical sensors. However, there does not appear to be any indication that the cited references, in combination, teach the use of electrical *and* non-electrical sensors concurrently, as generally recited by independent claims 9-16 and 25-32.

4. **<u>Request Withdrawal of the Rejection.</u>**

For the reasons discussed above, Appellants respectfully submit that no *prima facie* case of obviousness is believed to exist with respect to independent claims 9-32 of the present application. Accordingly, Appellants respectfully request that the Board direct the Examiner to withdraw the rejection of claims 9-32 under 35 U.S.C. § 103(a) and to allow these claims.

Conclusion

Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or the Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: August 26, 2009

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8. APPENDIX OF CLAIMS ON APPEAL

1. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of image data.

2. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

reconstructing the set of image data to generate a set of reconstructed data;

processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of reconstructed data.

3. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

a routine for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

4. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

a routine for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

5. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the means for acquiring the set of image data, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

means for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

6. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data for two or more types of organs from at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the means for acquiring the set of image data, wherein the set of image data is acquired substantially concurrent with the set of motion data, and wherein the two or more types of organs each perform different physiological functions;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

means for reconstructing the set of image data to generate a set of reconstructed data; and

means for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

7. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, and to process a portion of the plurality of signals based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the plurality of signals from the data processing circuitry; and

a sensor-based motion measurement system configured to measure electrical or non-electrical activity indicative of the motion of two or more types of organs during imaging to contribute to the set of motion data, wherein the sensor-based motion measurement system is separate from the imager, and wherein the two or more types of organs each perform different physiological functions.

8. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, to reconstruct the plurality of signals to generate a set of reconstructed data, and to process a portion of the reconstructed data based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the reconstructed data from the data processing circuitry; and

a sensor-based motion measurement system configured to measure electrical or non-electrical activity indicative of the motion of two or more types of organs during imaging to contribute to the set of motion data, wherein the sensor-based motion measurement system is separate from the imager, and wherein the two or more types of organs each perform different physiological functions.

9. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of image data.

10. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

reconstructing the set of image data to generate a set of reconstructed data;

processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of reconstructed data.

11. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

a routine for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

12. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the at least one imaging device, wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

a routine for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

13. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the means for acquiring the set of image data, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

means for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

14. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data for a respiratory organ from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the means for acquiring the set of image data, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

means for reconstructing the set of image data to generate a set of reconstructed data; and

means for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

15. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, and to process a portion of the plurality of signals based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the plurality of signals from the data processing circuitry;

a first sensor-based motion measurement system configured to measure electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data; and

a second sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data;

wherein the first and second sensor-based motion measurement systems are separate from the imager.

16. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, to reconstruct the plurality of signals to generate a set of reconstructed data, and to process a portion of the reconstructed data based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the reconstructed data from the data processing circuitry; and

a first sensor-based motion measurement system configured to measure electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data; and

a second sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data; and

wherein the first and second sensor-based motion measurement systems are separate from the imager.

17. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of image data.

18. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest using at least one imaging device;

acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

reconstructing the set of image data to generate a set of reconstructed data;

processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of reconstructed data.

19. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

a routine for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

20. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest using at least one imaging device;

a routine for acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the at least one imaging device, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

a routine for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

21. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the means for acquiring the set of image data, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

means for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

22. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest;

means for acquiring a set of motion data comprising cardiac motion data acquired by one or more types of non-electrical sensors and respiratory motion data acquired by at least one of one or more types of electrical sensors or one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors for acquiring the cardiac and respiratory motion data are separate from the means for acquiring the set of image data, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

means for reconstructing the set of image data to generate a set of reconstructed data; and

means for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

23. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, and to process a portion of the plurality of signals based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the plurality of signals from the data processing circuitry;

a sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a heart during imaging to contribute to the set of motion data; and

at least one sensor-based motion measurement system configured to measure electrical or non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data;

wherein each of the sensor-based motion measurement systems is separate from the imager.

24. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, to reconstruct the plurality of signals to generate a set of reconstructed data, and to process a portion of the reconstructed data based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the reconstructed data from the data processing circuitry; and

a sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a heart during imaging to contribute to the set of motion data; and at least one sensor-based motion measurement system configured to measure electrical or non-electrical activity indicative of the motion of a respiratory organ during imaging to contribute to the set of motion data;

wherein each of the sensor-based motion measurement systems is separate from the imager.

25. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of image data.

26. A method for processing image data, comprising the steps of:

acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

reconstructing the set of image data to generate a set of reconstructed data;

processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors; and

displaying or storing an image generated from the portion of the set of reconstructed data.

27. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

a routine for acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

a routine for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

28. One or more computer readable storage structures comprising:

a routine for acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

a routine for acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

a routine for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

a routine for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

29. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

means for acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the sets of motion data to extract two or more retrospective gating points and one or more motion compensation factors; and

means for processing a portion of the set of image data based upon the two or more retrospective gating points and the one or more motion compensation factors.

30. An imaging system, comprising:

means for acquiring a set of image data representative of a region of interest from an imager of one of a MRI system, a PET system, a nuclear imaging system, an X-ray system, a PET-CT system, and an ultrasound system;

means for acquiring a set of motion data for a heart from one or more types of electrical sensors and one or more types of non-electrical sensors, wherein the electrical and non-electrical sensors are separate from the imager, and wherein the set of image data is acquired substantially concurrent with the set of motion data;

means for processing the set of motion data to extract two or more retrospective gating points and one or more motion compensation factors;

means for reconstructing the set of image data to generate a set of reconstructed data; and

means for processing a portion of the set of reconstructed data based upon the two or more retrospective gating points and the one or more motion compensation factors.

31. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest, wherein the imager comprises one of a MRI imager, a PET imager, a nuclear imager, an X-ray imager, a PET-CT imager, and an ultrasound imager;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, and to process a portion of the plurality of signals based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the plurality of signals from the data processing circuitry;

at least one sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a heart during imaging to contribute to the set of motion data; and

at least one sensor-based motion measurement system configured to measure electrical activity indicative of the motion of the heart during imaging to contribute to the set of motion data;

wherein each of the sensor-based motion measurement systems is separate from the imager.

32. An imaging system comprising:

an imager configured to generate a plurality of signals representative of a region of interest, wherein the imager comprises one of a MRI imager, a PET imager, a nuclear imager, an X-ray imager, a PET-CT imager, and an ultrasound imager;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to receive the plurality of signals, to process a set of motion data to derive two or more retrospective gating points and one or more motion compensation factors, to reconstruct the plurality of signals to generate a set of reconstructed data, and to process a portion of the reconstructed data based upon the two or more retrospective gating signals and the one or more motion compensation factors;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive at least the processed portion of the reconstructed data from the data processing circuitry;

at least one sensor-based motion measurement system configured to measure non-electrical activity indicative of the motion of a heart during imaging to contribute to the set of motion data; and

at least one sensor-based motion measurement system configured to measure electrical activity indicative of the motion of the heart during imaging to contribute to the set of motion data;

wherein each of the sensor-based motion measurement systems is separate from the imager.

9. APPENDIX OF EVIDENCE

None.

10. APPENDIX OF RELATED PROCEEDINGS

None.